EAD **090232-00-0404**

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European Assessment Document for

Kits for self-supporting and interconnected ventilated cavity walls

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

This EAD covers the assessment of kits for self-supporting and interconnected ventilated cavity walls (from now on “kit”), where the walls are made of masonry units which are dry stacked, mutually mechanically connected and connected to the substrate.

The EAD is applicable to kits consisting of the following components (see also Figure 1.1.1, 1.1.2 and 1.1.3):

1. Masonry units:

   Clay masonry units in accordance with EN 771-1[1].

   The masonry units may include grooves, dowel holes, drill or undercut holes depending on the geometry of the mutually mechanical connection.

   Minimum data for describing the masonry units are: type of material, external dimensions, detailed geometry and dimensions of grooves, dowel holes, drill or undercut holes and density or weight per square meter.

   The masonry units are able to guide their vertical dead weight to a support.

2. Connecting elements between masonry units, made of steel or stainless steel:

   Minimum data for the connecting elements are: geometric and physical parameters (such as form and dimensions, cross section, and material parameters (such as type of material and mechanical material properties).

3. Wall ties:

   Wall ties in accordance with EN 845-1.

   Minimum data for the wall ties are: geometric and physical parameters (such as form and dimensions, cross section, and material parameters (such as type of material and mechanical material properties).

4. Connecting elements, made of steel or stainless steel, between wall ties and masonry units.

   Connecting elements between the wall ties and the masonry unit are specified by geometric and physical parameters (such as form and dimensions, cross section, and material parameters (such as type of material and mechanical material properties).

   NOTE: Connecting elements between wall ties and masonry units can be the same as the connecting elements between the masonry units themselves.

5. Means to hold upper layers of horizontal endings together:

   Clamping elements, made of steel or stainless steel, or glue used to hold the upper layers of horizontal endings in vertical direction together either below openings or at the top of the outer leaf.

   Minimum data for clamping elements are: geometric and physical parameters (such as form and dimensions, cross section, and material parameters (such as type of material and mechanical material properties).

   Minimum data for the glue is: characteristics (type of material and composition).

[1] All undated references to standards in this EAD are to be understood as references to the dated versions listed in chapter 4.

Legend for Figures 1.1.1 to 1.1.3:

1 Masonry unit.
2 Connecting element between masonry units.
3 Connecting element between wall tie and masonry units.
4 Wall tie.
5 Clamping element.
6 Glue.

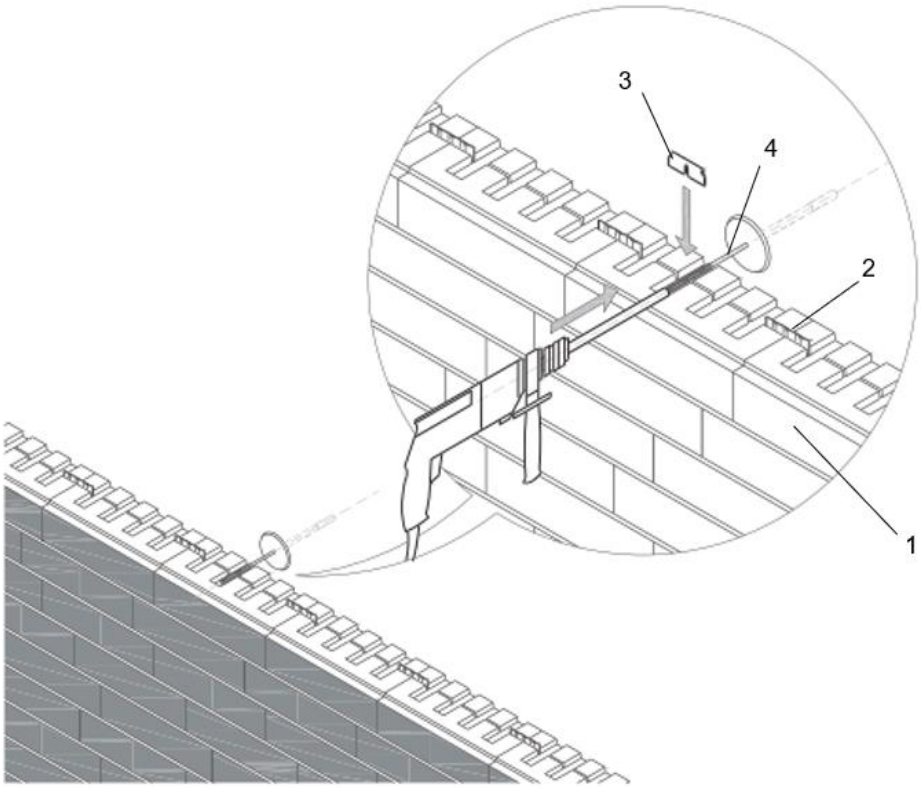

Figure 1.1.1: Kit - Components.

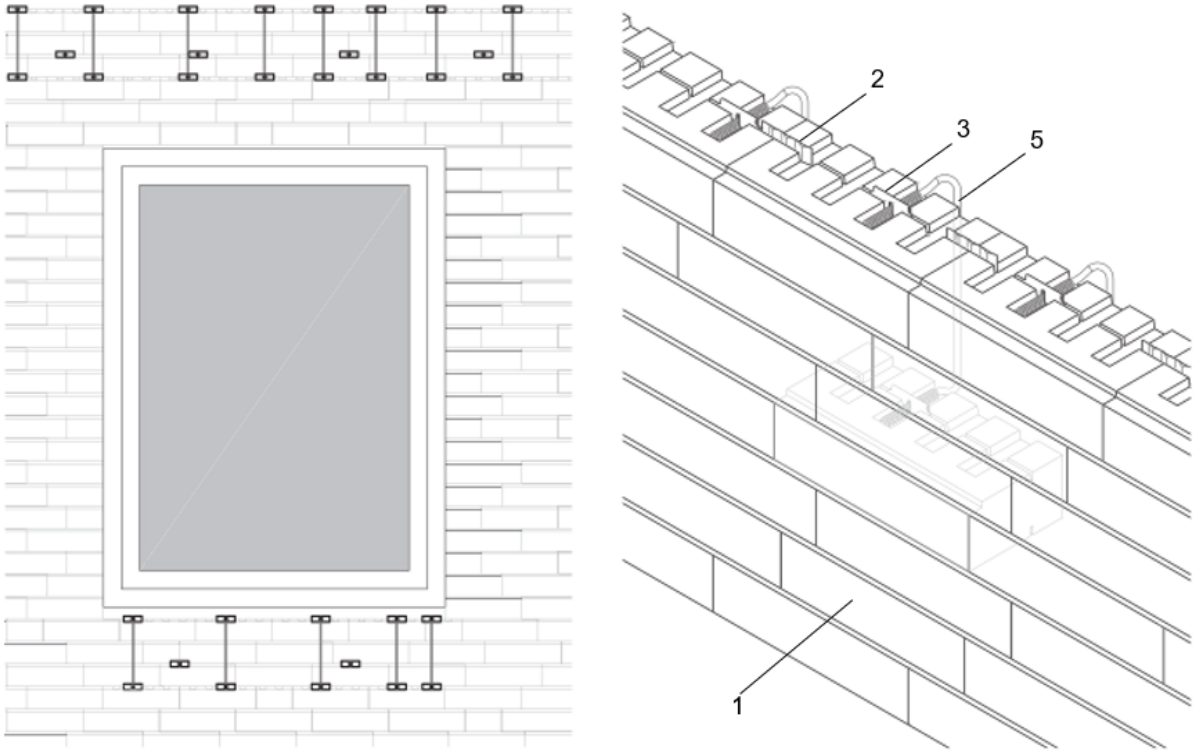

Figure 1.1.2: Kit – Components - Means to hold upper layers of horizontal endings together – Clamping elements.

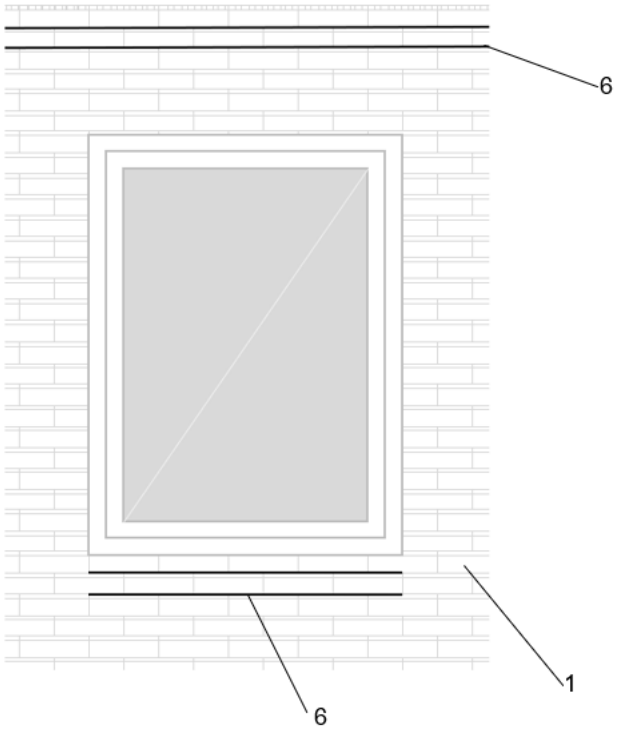

Figure 1.1.3: Kit – Means to hold upper layers of horizontal endings together – Glue.

The kits do not contain insulation products, windows or door products.

The masonry units can be dry stacked regardless of whether the headers have open or closed joints.

Between the masonry units and the substrate there is a cavity that includes a ventilated air space (see Clause 1.3.6) that provides drainage of rainwater which has penetrated through the outer leaf. In the case of closed joints, the ventilated air space is secured by ventilation openings located at least at the building base point and at the roof edges (see Clause 1.3.6). Cavity may contain a thermal insulation layer attached on the substrate provided that there is also the ventilated air space in the cavity as defined in Clause 1.3.6.

Any kit component may be produced (manufactured) or not produced (purchased on the market or from a specific supplier) by the kit manufacturer.

The kit is not covered by a harmonised European standard (hEN).

The kit is not covered by EAD 090062-01-0404 because this EAD covers masonry units which are dry stacked, where not all masonry units are fixed to the substrate and where the masonry units are able to guide its vertical dead weight to a support (i.e., masonry units are self-supporting elements). They do however not contribute to the stability of the substrate against they are installed. The outer leaf will normally contribute to durability of the works by providing enhanced protection from the effect of weathering. They are not intended to ensure airtightness of the building.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations, e.g., with regard to the intended end use conditions, having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA as long as the details of the assessment methods as laid down in this EAD are respected.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

This EAD covers the intended use of kits as cavity walls (rainscreens).

The kits are connected to substrates made of masonry (clay, concrete or stone) or concrete (cast on site or as prefabricated panels) or timber or metal frame with wall ties in new or existing buildings (retrofit).

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the kit for the intended use of 50 years when installed in the works (provided that the kit is subject to appropriate installation (see 1.1)). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[2].

[2] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD

1.3.1 Substrate

The term "substrate" refers to a wall, which in itself already meets the necessary airtightness and mechanical strength requirements (resistance to static and dynamic loads), as well as a relevant watertightness and water vapour resistance. The substrate walls can be made of masonry (clay, any kind of concrete or stone), concrete (cast on site or as prefabricated panels), timber or metal frame.

1.3.2 Connecting element between masonry units

Elements used to mutually connect the masonry units.

1.3.3 Connecting elements between masonry units and wall ties

Elements used to connect the masonry units to the wall ties.

1.3.4 Cavity

It is the space between the masonry units and the substrate.

1.3.5 Ventilated air space

A layer of air between the substrate or insulation layer and masonry units connected to the external environment permitting the drainage and dry-out of the water that may be found in this space due to condensations or rain penetration and the water vapour diffusion from the internal side of the substrate.

Cavity walls are considered as ventilated when the following criteria are fulfilled:

- The distance between the masonry units and the insulation layer or the substrate accordingly (ventilated air space) amounts to at least 20 mm. The ventilated air space may be reduced locally to 5 to 10 mm depending on the masonry units and the subframe, provided that it does not affect the draining and/or ventilation function.
- Ventilation openings are envisaged, as a minimum, at the building base point and at the roof edges with cross-sections of at least 50 cm² per linear metre.

1.3.6 Means to hold the upper layers of horizontal endings together

Clamping element or glue used to hold the upper layers of horizontal endings of the outer leaf or under openings in the outer leaf vertically together in order to prevent easy disassembly of the masonry units.

1.3.7 Symbols

ΔR_w [dB]	The weighted improvement of the airborne sound insulation.
C and C_{tr} [dB]	Spectrum adaptation terms of the airborne sound insulation.
f_k [N/mm²]	The characteristic vertical compressive strength of the dry stacked masonry units giving 75 % confidence that 95 % of the test results will be higher than this value.
f_{mean} [N/mm²]	The arithmetic average compressive strength.
H1, H2, H3	Hard body impacts for 1 Joule, 3 Joules and 10 Joules respectively.
k_n	The variable as a function of the number of test specimens for 5 % (p = 0,95) with 75 % confidence level when the population standard deviation is unknown (see Table E.1).
Q [Pa]	The maximum wind load resistance.
R_w [dB]	Sound reduction index of the airborne sound insulation.
S	The standard deviation of series under consideration.
S1, S2, S3, S4	Soft body impacts for 10 Joules, 60 Joules, 100 Joules and 400 Joules respectively.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of the kits for self-supporting and interconnected dry stacked masonry units is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class
Basic Works Requirement 3: Hygiene, health and the environment			
2	Watertightness of joints (protection against driving rain)	2.2.2	Description / Level
3	Content, emission and/or release of dangerous substances	2.2.3	Description
Basic Works Requirement 4: Safety and accessibility in use			
4	Wind load resistance	2.2.4	Level
5	Impact resistance	2.2.5	Level
6	Mechanical resistance - vertical compressive strength of the (self-supporting) assembly of the dry stacked masonry units	2.2.6.1	Level
7	Mechanical resistance - connecting element in combination with the wall tie (horizontal resistance)	2.2.6.2	Level
Basic Works Requirement 5: Protection against noise			
8	Airborne sound insulation	2.2.7	Level
Aspects of durability			
9	Freeze-thaw resistance	2.2.8.1	Description / Level

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

If for any components covered by harmonised standards or European Technical Assessments the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

2.2.1 Reaction to fire

In case the kit does not include the glue to hold upper layers of horizontal endings together (see bullet 5 and Figure 1.1.3 in Clause 1.1), the kit is considered to satisfy the requirements of class A1 of the reaction-to-fire performance in accordance with the Commission Decision 96/603/EC as amended by Commission Decision 2000/605/EC and 2003/424/EC without the need for testing on the basis of it fulfilling the conditions set out in that Decision and its intended use being covered by that Decision.

Therefore, when the conditions referred to above are fulfilled, the performance of the kit is class A1 which shall be given in the ETA.

In case the kit includes the glue to hold upper layers of horizontal endings together (see bullet 5 and Figure 1.1.3 in Clause 1.1), the kit shall be tested, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1. The kit shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

The following parameters shall be taken into account when selecting and preparing the test specimens. In addition to Clause 5.1.1 of EN 13823 the top layers of the short and long wing shall be glued (see also Figure 1.1.3). The quantity of glue and the amount of top layers to be glued shall be according to Manufacturer’s Product Installation Instructions (MPII) or, when this information is not given in the MPII, the top 5 layers of the short and long wing shall be glued:

- Glue type,
- Organic content (related to the mass in dried condition).
- Thickness of glue joints.
- Density.

Test results shall be applicable for:

- All glue types of the same defined glue-family.
- The same or lower organic content (related to the mass in dried condition).
- The same density (if only one density was tested) or the full density range between those values evaluated in the tests.
- The same or lower thickness.
- The same or lower applied quantity per unit area.

The reaction to fire class shall be stated in the ETA.

2.2.2 Watertightness of joints (protection against driving rain)

If there are open joints in the kit the result shall be expressed in the ETA as “not watertight”.

In the case of kits with closed joints, the watertightness of the kit shall be assessed by testing in accordance with EN 12865 Procedure A (see also Annex A). At least the worst case (maximum area of open joints, minimum thickness of the masonry units) shall be tested.

The limit level of pressure in [Pa] shall be stated in the ETA.

2.2.3 Content, emission and/or release of dangerous substances

The performance of the product related to the emissions and/or release and, where appropriate, the content of dangerous substances will be assessed on the basis of the information provided by the manufacturer[3] after identifying the release scenarios taking into account the intended use(s) of the product and the Member States where the manufacturer intends his product to be made available on the market.

The identified intended release scenarios for this product and intended use with respect to dangerous substances are:

S/W1: Product with direct contact to soil, ground- and surface water

S/W2: Product with indirect contact to soil, ground- and surface water.

2.2.3.1 Leachable substances

For the intended use covered by the release scenario S/W1 and/or S/W2, the performance of the kit concerning leachable substances shall be assessed.

The dangerous substances assessment of the kit shall be carried out by means of the assessment of the most relevant kit component material, which is the masonry unit material.

A leaching test with subsequent eluate analysis must take place, each in duplicate. Leaching tests of the masonry unit conducted in accordance with EN 16637-2, but considering the steps below indicated for the leachant renewal. The leachant shall be pH-neutral demineralised water and the ratio of liquid volume to surface area shall be (80 ± 10) l/m².

Samples shall be prepared in accordance with Clause 8.2 of EN 16637-2.

The eluate shall be produced by a tank test in accordance with EN 16637-2. The eluates taken after 6 hours, 1 day, 2 days and 6 hours, 4 days, 9 days, 16 days, 36 days and 64 days shall be analysed for following environmentally relevant parameters:

- arsenic (As); chromium (Cr); fluor (F); molybdenum (Mo); vanadium (V); selenium (Se),
- sulfate (SO42-).

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3 The manufacturer may be asked to provide to the TAB the REACH related information which shall accompany the DoP (cf. Article 6(5) of Regulation (EU) No 305/2011).

The manufacturer is **not** obliged to:
- provide the chemical constitution and composition of the product (or of constituents of the product) to the TAB, or
- provide a written declaration to the TAB stating whether the product (or constituents of the product) contain(s) substances which are classified as dangerous in accordance with Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the SGDS, taking into account the installation conditions of the construction product and the release scenarios resulting from there.

Any information provided by the manufacturer regarding the chemical composition of the products is not to be distributed to EOTA to other TABs or beyond.

The parameters shall be analysed in accordance with EN 17195, EN 17197 or EN 17200; those three methods are equivalent.

Measured concentration of the leaching test in accordance with EN 16637-2 of these masonry units shall be expressed per step for each parameter in µg/L and mg/m^2. Additionally, the cumulatively released quantities shall be expressed for each parameter in mg/m^2.

The used test methods for the analysis of the parameters shall be documented, including the equipment and its measurement range.

2.2.4 Wind load resistance

The wind load resistance (suction and pressure) of the assembled kit shall be assessed in accordance with the method given in Annex B.

The number of tests depends on the combination of parameters presented for the kit to be assessed. At least the worst case (the mechanically weakest case, based on the type, dimensions and weakest material of the masonry units, the type of connecting elements and the type, dimensions and weakest tensile and compressive load capacity of wall ties and the larger spacing between them) of the assembled kit shall be tested.

For deciding the type of load to be applied in the test (suction and pressure), the specific configuration / composition of the kit components shall be considered. In case of doubt, it is recommended to carry out both tests: suction load and pressure load.

One test specimen for each chosen geometry shall be assessed.

The assessment shall be based on data from the wind suction and wind pressure tests (see Annex B).

The maximum wind load resistance for suction and pressure, Q in [Pa] for the assembled kit in relation to the type of connecting elements, the type of wall ties and their spacing shall be stated in the ETA.

2.2.5 Impact resistance

The impact resistance shall be tested in accordance with the method indicated in Annex C.

At least the worst case (the mechanically weakest case, see Clause C.5) of the assembled kit shall be tested.

Hard body and soft body impact resistance in [J] of each tested kit configuration shall be stated in the ETA.

2.2.6 Mechanical resistance

2.2.6.1 Vertical compressive strength of the (self-supporting) assembly of the dry stacked masonry units

The vertical compressive strength of the dry stacked masonry units using the connecting elements between the masonry units themselves shall be tested in accordance with the method indicated in Annex D.

The characteristic vertical compressive strength for the dry stacked masonry units "f_k" in [N/mm^2] shall be stated in the ETA.

2.2.6.2 Connecting element in combination with the wall tie (horizontal resistance)

Resistance of the connecting element between wall ties and masonry units placed in the grooved masonry unit in combination with the wall tie shall be tested in accordance with the method specified in EN 846-6. At least the worst case (the mechanically weakest case, based on the type minimum dimensions and weakest material of the masonry units, the type of connecting elements and the type minimum dimensions and weakest material of wall ties) of the assembled kit shall be tested. The preparation of the test shall be in accordance with Annex E instead of Clause 6 of EN 846-6.

The following data shall be stated in the ETA:

- The arithmetic average and minimum value of the tensile load capacity in [N].
- The arithmetic average and minimum value of the compressive load capacity in [N].
- The arithmetic average value of the displacement at one third of the arithmetic average value of the tensile and compressive load capacity in [mm].

2.2.7 Airborne sound insulation

The improvement of airborne sound insulation shall be tested in accordance with EN ISO 10140-1 Annex G.

At least the worst case (based on the lowest mass per m² of the masonry units, highest amount of wall tie connections to the substrate) shall be tested for a standard wall with low critical frequency a in accordance with Clause B.2 of EN ISO 10140-5 and a standard wall with medium critical frequency in accordance with to Clause B.4 of EN ISO 10140-5.

The ratings of airborne sound insulation shall be undertaken in accordance with EN ISO 717-1.

The weighted improvement ΔR_w in [dB], the sound reduction index R_w in [dB] with and without the assembled kit, the spectrum adaptation terms C and C_{tr}, in [dB] and the substrate used shall be stated in the ETA.

2.2.8 Durability

2.2.8.1 Freeze-thaw resistance

Clay masonry units shall be assessed in accordance with EN 772-22 on a panel (made of masonry units and mortar) with a surface area between 0,25 m² and 0,5 m² (EN 772-22, Clause 7.1). If the test results show that the masonry units are not sensitive to freeze-thaw (i.e., F2 in accordance with Clause 10.2 of EN 772-22), no additional test shall be carried out.

In other cases, the assembled kit (masonry units, connecting elements between wall ties and masonry units and the wall ties) shall be assessed by means of a mechanical resistance tests in accordance with Clause 2.2.6.2 before and after a maximum of 100 freeze-thaw cycles of the masonry units in accordance with Clause 9.2 of EN 772-22.

The number of test specimens shall be the same as those of the mechanical tests.

The following data shall be stated in the ETA:

- In case the test results show that the masonry units are not sensitive to freeze-thaw it shall be stated in the ETA: “freeze-thaw resistant”.
- In other cases:
    - The test results after freeze-thaw cycles in accordance with the corresponding mechanical tests (see Clause 2.2.6.2).
    - The ratio (division between the mechanical test results after and before cycles).
    - The number of freeze-thaw cycles applied.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is Commission Decision 2003/640/EC.

The applicable AVCP system is 2+ for any use except for uses subject to regulations on reaction to fire.

For uses subject to regulations on reaction to fire the applicable AVCP systems regarding reaction to fire are 1, or 3, or 4 depending on the conditions defined in the said Decision.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

The manufacturer (regarding the components he buys from the market with DoP) shall take into account the Declaration of Performance issued by the manufacturer of that component. No retesting is necessary.

The actions to be undertaken by the manufacturer of the product for the different components of the kit are laid down in Table 3.2.2 when the components are produced by the manufacturer himself and Table 3.2.3 when the components are not produced by the manufacturer himself but by its supplier under the specifications of the manufacturer.

Table 3.2.1: Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Reaction to fire (in case of glue)	Indirect test as specified in Table 3.2.7	See Table 3.2.7	See Table 3.2.7	See Table 3.2.7
2	Reaction to fire (in case of glue)	Direct test according to EN 13823	According to the Control Plan	According to tests or control methods	According to the Control Plan (*)
3	Vertical compressive strength of the (self-supporting) assembly of the dry stacked masonry units	Test or control based on Clause 2.2.6.1	According to the Control Plan	According to tests or control methods	According to the Control Plan (*)
4	Connecting element in combination with the wall tie (horizontal resistance)	Test or control based on Clause 2.2.6.2	According to the Control Plan	According to tests or control methods	According to the Control Plan (*)
	Components produced by the manufacturer himself:				
5	Masonry units	See Table 3.2.2	See Table 3.2.2	See Table 3.2.2	See Table 3.2.2
6	Connecting elements	See Table 3.2.3	See Table 3.2.3	See Table 3.2.3	See Table 3.2.3
7	Connecting elements between masonry unit and wall tie	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4	See Table 3.2.4
8	Wall ties	See Table 3.2.5	See Table 3.2.5	See Table 3.2.5	See Table 3.2.5
9	Clamping elements	See Table 3.2.6	See Table 3.2.6	See Table 3.2.6	See Table 3.2.6
10	Glue	See Table 3.2.7	See Table 3.2.7	See Table 3.2.7	See Table 3.2.7
	Components not produced by the manufacturer himself (*):				
11	Connecting elements	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8
12	Connecting elements between masonry unit and wall tie	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8
13	Wall ties	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8
14	Clamping elements	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8
15	Glue	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8	See Table 3.2.8
(*)	Components produced by the supplier under the specifications of the manufacturer.				

Table 3.2.2: Control plan when the masonry units are produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
	Clay masonry units				
1	Clay masonry units	In accordance with Clause 8.3 of EN 771-1	According to the Control Plan	---	According to the Control Plan (*)
	Finished clay masonry unit				
2	Geometry (form and dimensions)	In accordance with Table C.1 of EN 771-1 and measuring and visual checks	According to the Control Plan	According to tests or control methods	According to the Control Plan (*)
3	Density or mass per unit area or per unit	In accordance with Table C.1 of EN 771-1	According to the Control Plan	According to tests or control methods	According to the Control Plan (*)
(*)	The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.				

Table 3.2.3: Control plan when the connecting elements are produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
	Incoming materials				
1	Received materials	Delivery ticket or label on package	Conformity with order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with order	---	Each delivery
	Finished connecting element				
2	Geometry (form and dimensions)	Measuring and visual checks	According to the Control Plan	According to the Control Plan	According to the Control Plan (*)
(*)	The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.				

Table 3.2.4: Control plan when the connecting elements between masonry unit and wall tie are produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
	Incoming materials				
1	Received materials	Delivery ticket or label on package	Conformity with order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with order	---	Each delivery
	Finished connecting element between masonry unit and wall tie				
2	Geometry (form and dimensions)	Measuring and visual checks	According to the Control Plan	According to the Control Plan	According to the Control Plan (*)
3	Mechanical characteristics (connecting element between masonry unit and wall tie)	Test or control based on Clause 2.2.6.1 and 2.2.6.2	According to the Control Plan	According to the Control Plan	According to the Control Plan (*)
(*)	The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.				

Table 3.2.5: Control plan when the wall ties are produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
	Incoming materials				
1	Received materials	Delivery ticket or label on package	Conformity with order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with order	---	Each delivery
	Wall ties				
2	Wall ties	In accordance with EN 845-1 clause 8.3	According to the Control Plan	According to the Control Plan	According to the Control Plan (*)
	Finished wall tie				
3	Geometry (form and dimensions)	Measuring and visual checks	According to the Control Plan	According to the Control Plan	According to the Control Plan (*)
4	Mechanical characteristics	Test or control based on Clause 2.2.6.1 and 2.2.6.2	According to the Control Plan	According to the Control Plan	According to the Control Plan (*)
(*)	The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.				

Table 3.2.6: Control plan when the clamping elements are produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
	Incoming materials				
1	Received materials	Delivery ticket or label on package	Conformity with order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with order	---	Each delivery
	Finished clamping element				
2	Geometry (form and dimensions)	Measuring and visual checks	According to the Control Plan	According to the Control Plan	According to the Control Plan (*)
(*)	The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.				

Table 3.2.7: Control plan when the glue is produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method (*)	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
	Incoming materials				
1	Received materials	Delivery ticket or label on package	Conformity with order	---	Each delivery
		Checking of supplier certificates or supplier tests	Conformity with order	---	Each delivery
2	Type of component material (*)	Checking of supplier certificates or supplier tests	Conformity with order	---	Each delivery
	Finished glue				
3	Organic content (*)	Ash content / loss on ignition In accordance with Clause 3.4.1 Otherwise, Thermo-gravimetry test base on EN ISO 11358-1	According to the Control Plan	According to the Control Plan	Once per batch(**)

(*) Indirect characteristic related to reaction to fire.

(**) The frequency is determined case by case depending on the type of production process, the variation in the volume produced and the production process control.

Table 3.2.8: Control plan when the components (masonry units / wall ties / connection elements / clamping elements / glue) are not produced by the manufacturer himself; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Components belonging to Case 1 (*)	(1)	Conformity with the order	Testing is not required	Each delivery
		(2)	According to the Control Plan	Testing is not required	Each delivery
2	Components belonging to Case 2 (*)	(1)	Conformity with the order	Testing is not required	Each delivery
	• Characteristics declared in DoP for the specific use within the kit.	(2)	According to the Control Plan	Testing is not required	Each delivery
	• Characteristics not declared in DoP for the specific use within the kit.	(3)	According to the Control Plan	According to the Control Plan	According to the Control Plan
3	Components belonging to Case 3 (*)	(1)	Conformity with the order	Testing is not required	Each delivery
		(3)	According to the Control Plan	According to the Control Plan	According to the Control Plan

(1) Checking of delivery ticket and/or label on the package.

(2) Checking of technical data sheet and DoP or, when relevant: supplier certificates or supplier tests or test or control according to control plan.

(3) Checking of supplier certificates or supplier tests or test or control according to control plan.

(*) Case 1: Component covered by a hEN or its own ETA for all characteristics needed for the specific use within the kit.

Case 2: If the component is a product covered by a hEN or its own ETA which, however, does not include all characteristics needed or the specific use within the kit or the characteristic is present as NPD option for the component manufacturer.

Case 3: The component is a product not (yet) covered by a hEN or its own ETA.

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.3.1.

Table 3.3.1 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the kit.	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer.	According to control plan	According to control plan	When starting the production or new line
Continuous surveillance, assessment and evaluation of factory production control					
2	The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan.	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1a.	According to control plan	According to control plan	Once per year

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).

In this case the cornerstones of the actions to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.2.

Table 3.3.2 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire.					
1	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire					
2	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Tables 3.2.1 to 3.2.8	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	Once per year

3.4 Specific methods of control and testing and used for the assessment and verification of constancy of performance

3.4.1 Ash content or Loss of ignition

For products which are inorganic, i.e., products containing a low percentage of organic compounds the test method shall be based on EN 13820.

For products which are organic, the test method shall be based on EN ISO 3451-1.

4 REFERENCE DOCUMENTS

EN 771-1:2011+A1:2015	Specification for masonry units - Part 1: Clay masonry units
EN 772-22:2018	Methods of test for masonry units - Part 22: Determination of freeze/thaw resistance of clay masonry units
EN 845-1:2013+A1:2016	Specification for ancillary components for masonry - Part 1: Wall ties, tension straps, hangers and brackets
EN 846-6:2012	Methods of test for ancillary components for masonry - Part 6: Determination of tensile and compressive load capacity and load displacement characteristics of wall ties (single end test)
EN 1052-1:1998	Methods of test for masonry - Part 1: Determination of compressive strength
EN 1990:2023	Eurocode - Basis of structural and geotechnical design
EN 10346:2015	Continuously hot-dip coated steel flat products for cold forming - Technical delivery conditions
EN 12865:2001	Hygrothermal performance of building components and building elements - Determination of the resistance of external wall systems to driving rain under pulsating air pressure
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 13820:2003:2003	Thermal insulating materials for building applications - Determination of organic content
EN 14879-2:2006	Organic coating systems and linings for protection of industrial apparatus and plants against corrosion caused by aggressive media - Part 2: Coatings on metallic components
EN 16637-2:2023	Construction products - Assessment of release of dangerous substances - Part 2: Horizontal dynamic surface leaching test
EN 17195:2023	Construction products: Assessment of release of dangerous substances - Analysis of inorganic substances in eluates
EN 17197:2023	Construction products: Assessment of release of dangerous substances - Analysis of inorganic substances in eluates and digests - Analysis by inductively coupled plasma optical emission spectrometry (ICP-OES)
EN 17200:2023	Construction products: Assessment of release of dangerous substances - Analysis of inorganic substances in eluates and digests - Analysis by inductively coupled plasma mass spectrometry (ICP-MS)
EN ISO 717-1:2020	Acoustics – Rating of sound insulation in buildings and of building elements – Part 1: Airborne sound insulation
EN ISO 3451-1:2019	Plastics - Determination of ash - Part 1: General methods
EN ISO 9223:2012	Corrosion of metals and alloys - Corrosivity of atmospheres - Classification, determination and estimation
EN ISO 10140-1:2021	Acoustics – Laboratory measurement of sound insulation of building elements – Part 1: Application rules for specific products
EN ISO 10140-5:2021	Acoustics - Laboratory measurement of sound insulation of building elements - Part 5: Requirements for test facilities and equipment
EN ISO 11358-1:2022	Plastics - Thermogravimetry (TG) of polymers - Part 1: General principles
EN ISO 12944-1:2017	Paints and varnishes - Corrosion protection of steel structures by protective paint systems - Part 1: General introduction
EAD 090062-01-0404	Kits for external wall claddings mechanically fixed

ANNEX A: ADDITIONAL GUIDANCE FOR WATERTIGHTNESS TEST

One test specimen for watertightness test shall be assembled in accordance with the Figure A.1 or A.2 representing the kit to be assessed.

Water penetration, shall be observed on the rear surface of the masonry units. Water penetration has occurred when the rear surface visually shows signs of leakage and/or the rear surface is wet.

Optionally, for improving the possible water spraying observation, a transparent material panel (e.g., polymethyl methacrylate (PMMA) thickness 8 mm) with 3 mm diameter holes (0,01 % holes) can be placed behind the masonry units (see Figure A.1 and Figure A.2).

E.g., if the size of sample shall be 2400 mm x 1200 mm, the display of holes can be made in accordance with Figure A.3.

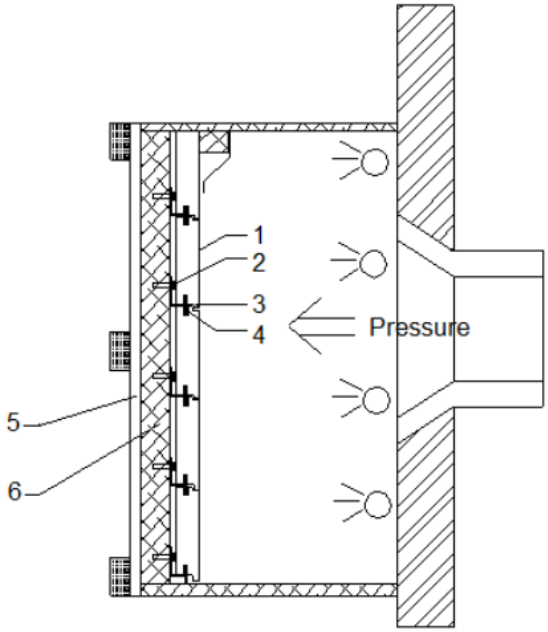

Figure A.1: Example of test device – vertical section.

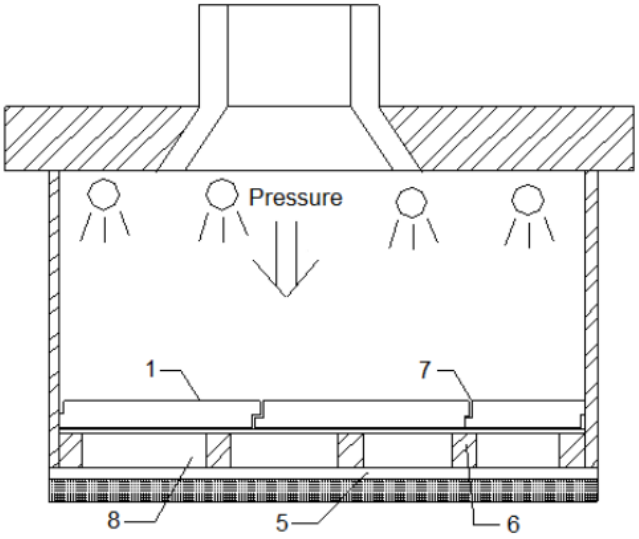

Figure A.2: Example of test device – horizontal section.

Legend for Figures A.1 and A.2

1. Masonry unit.
2. Connecting element or subframe connection to the supporting test rig.
3. Horizontal joint between two masonry units.
4. Connecting element.
5. Transparent panel (optional).
6. Supporting test rig.
7. Vertical joint between two masonry units.
8. Cavity.

Test report shall describe the test specimen. At least the following information shall be defined (data based on the Manufacturer's Product Installation Instructions):

- Masonry units: geometry.
- Connecting elements between wall ties and masonry units: material, geometry and span between the wall ties (horizontally and vertically).

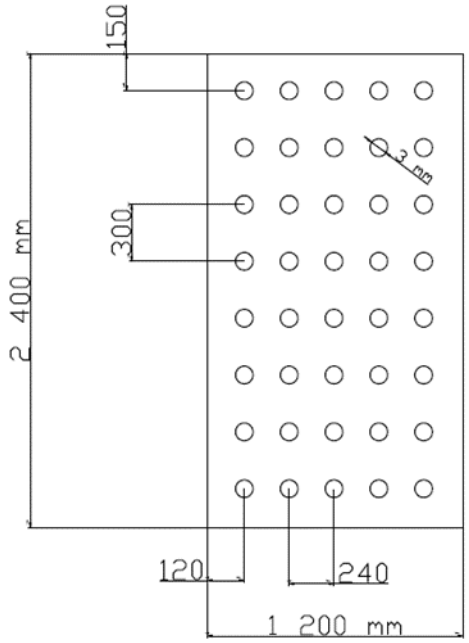

Figure A.3: Example of distances between holes (drawing not to scale).

ANNEX B: WIND SUCCTION AND PRESSURE LOAD TESTS

The purpose is to establish the effects of suction and pressure loads on the assembled kit.

The number of tests depends on the combination of parameters presented for the assembled kit.

As a minimum, the mechanically weakest design shall be tested.

B.1 Wind suction test

B.1.1 Preparation of the test specimen

The test specimen shall be mounted in the test equipment in accordance with the Manufacturer's Product Installation Instructions.

The test specimen is defined as follows:

- A non-airtight substrate (test rig) such as wood or steel rigid frame. A masonry or concrete wall may also be used as substrate; however, they shall include at least one hole per square metre with a minimum diameter of at least 150 mm.
- The assembled kit shall be fixed to the test rig.
- The dimensions of the test specimen depend on the size of the masonry unit and the specified connecting elements:
    - a minimum surface of 1,5 m^2 shall be tested.

To define the mechanically weakest design the following aspects shall be taken into account:

- The mechanically weakest masonry unit (e.g., minimum thickness, minimum strength, etc.).
- Connecting elements (e.g., minimum thickness, etc).
- Means to hold the upper layers of horizontal endings (the weakest elements are the clamping elements. In case the kit does not provide clamping elements glue is the weakest element).
- Span between wall ties (e.g., maximum horizontal and vertical span based on MPII).

B.1.2 Test equipment

The test equipment consists of a pressure or suction chamber (see Figure B.1.2.1) against which shall be placed the assembled kit. The depth of chamber shall be sufficient for a constant pressure or suction to be exerted on the test specimen applied to the external surface of the assembled kit irrespective of its possible deformation. The chamber shall be mounted on a rigid frame. The assembled kit acts as the seal between the chamber and the environment. The connection between the assembled kit and the chamber shall be sufficient to allow a realistic deformation of the test specimen under the influence of simulated wind suction.

B.1.3 Test procedure

The uniformly distributed loads shall be exerted on the surface of the assembled kit.

The test shall be performed in successive steps (two steps of 300 Pa, one step of 500 Pa and one step of 1000 Pa, then steps of +200 Pa thereafter, at each step the load shall be maintained constant for at least 10 seconds and unloaded after each step; see Figure B.1.3.1).
The test shall be continued until failure occurs.

The displacement shall be measured, at the main points where this displacement may be observed (e.g., central point of the masonry unit, central point between the connecting elements, etc.), as a function of the load and reported in tabular or graphic form.

With the differential pressure reduced to zero, the permanent deflection shall be noted after 1 minute recovery. Where manual mechanical measurements are used, the subsequent loading steps shall be carried out once this 1 minute recovery shall be measured, therefore, the unload period between loading steps may be longer than those defined in Figure B.1.3.1. The pressure at which any damage occurs shall be noted.

B.1.4 Observations during the test

Failure is defined by any one of the following events:

- Any masonry unit, connecting element or wall tie breaks.
- Any connecting element or wall tie presents a permanent deformation that affects the stability of the test specimen.
- Falling of detached components.

B.1.5 Test results

The test result is:

- The failure load Q in Pa.
- The type of failure and the place where this failure occurs in the test specimen.
- The value of maximum permanent deflection (after 1 minute recovery), the maximum deflection of the test specimen and the load and sensor position for this maximum permanent deflection and maximum deflection.

B.1.6 Test specimen description

It is necessary to describe the test specimen by giving details about:

- Masonry unit (material specifications and geometry).
- Connecting element (material and geometry and number and disposition of connecting elements).
- Wall ties between the test equipment and the assembled kit (position, generic type, material and geometry).

B.2 Wind pressure test

The test procedure shall be similar to B.1, the only difference being that the wind action shall be reversed.

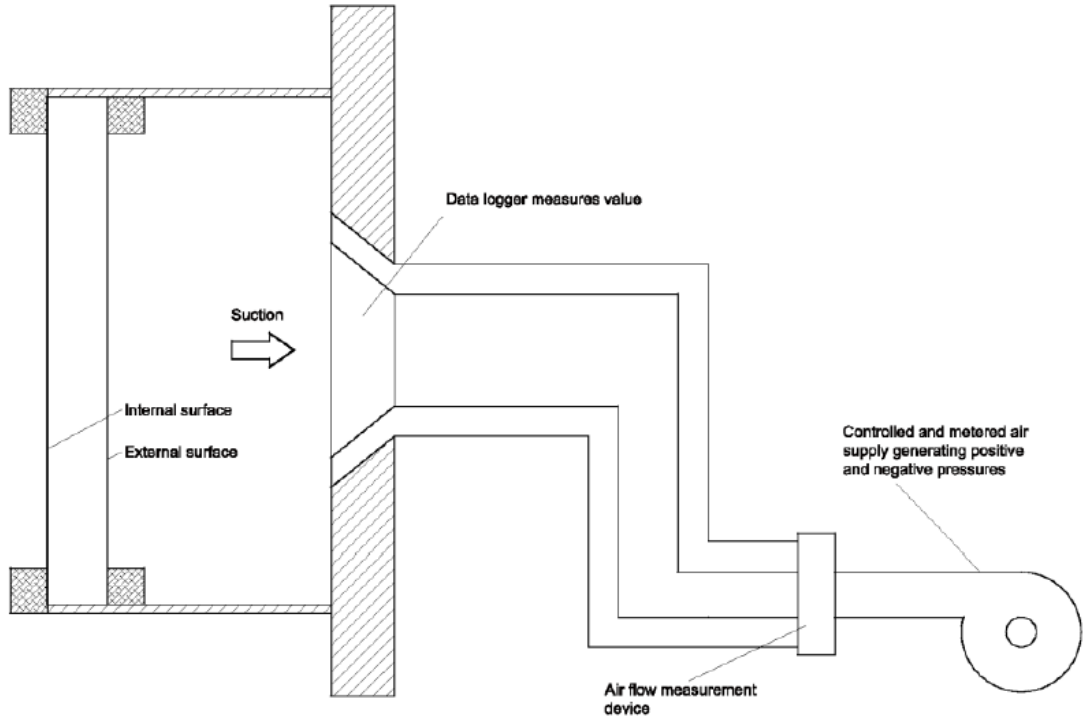

Figure B.1.2.1: Example of wind pressure and suction apparatus.

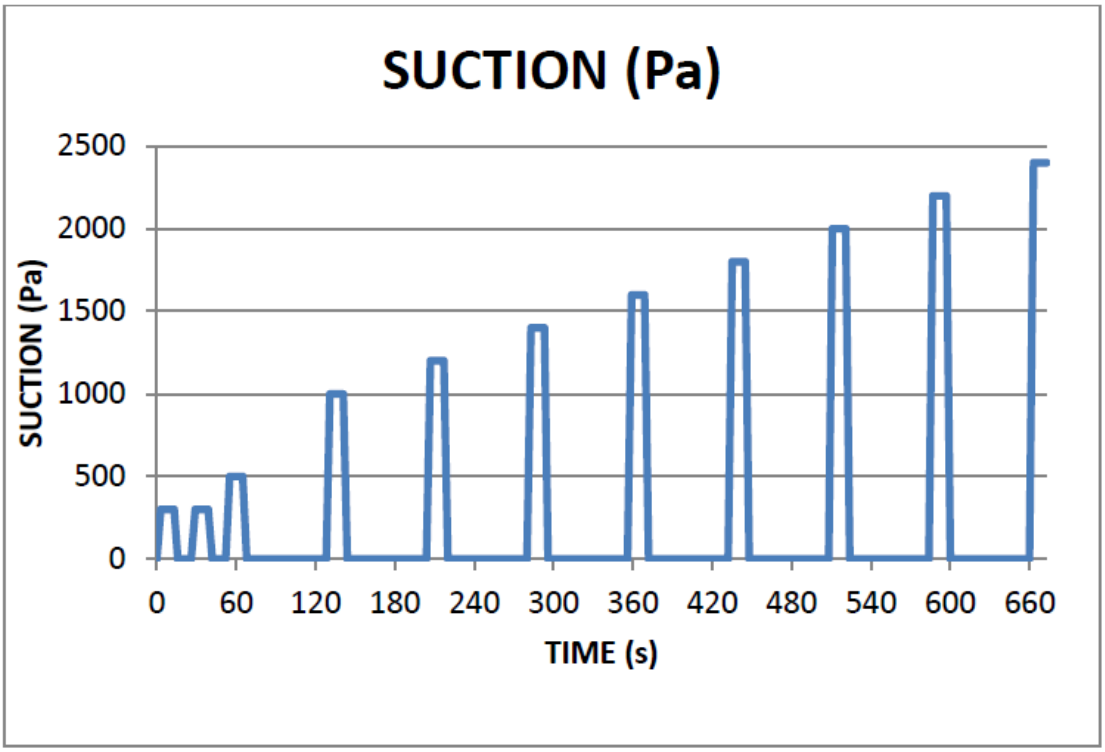

Figure B.1.3.1: Example of wind load steps.

ANNEX C: IMPACT RESISTANCE TEST

C.1 General

The purpose is to establish the impact resistance of the kit considering hard body and soft body impacts.

The bodies to impact and the test equipment are indicated in Clause C.4. The points of impact shall be selected considering the behaviour of the kit components (mainly the masonry units and the spacing of the wall ties) and the substrate. For selecting these points of impacts, it is recommended to carry out some indicative impacts for finding the weakest areas.

Hard body impacts are:

- H1 and H2 (1 J and 3 J respectively), carried out with the steel ball weighing 0,5 kg and from a height of 0,20 m and 0,61 m respectively (at least in three locations).

- H3 (10 J), carried out with the steel ball weighing 1,0 kg and from a height of 1,02 m (at least in three locations).

Soft body impacts are:

- Small soft body S1 and S2 (10 J and 60 J respectively), carried out with the soft ball weighing 3,0 kg and from a height of 0,34 m and 2,04 m respectively (at least in three locations).

- Large soft body S3 and S4 (100 J and 400 J respectively), carried out with the spherical bag weighing 50,0 kg and from a height of 0,61 and 0,82 m respectively (at least in the space between two profiles).

National building regulations in some member states may have specific requirements. In this case, in addition to those presented above, other energy values may be considered for the hard and soft body impacts. Any additional results and corresponding energy values shall be indicated in the ETA.

At least, the mechanically weakest design (Clause C.5) shall be tested.

The size of the test specimen shall be chosen to carry out all the impacts indicated in Table C.3.1.

The dimensions of any indentation shall be reported. Any damage observed shall be recorded.

C.2 Preparation of the test specimen

C.2.1 Hard body impact

For the hard body impact test the masonry units to be tested shall be laid down on a horizontal surface so that the face to be tested shall be on the upper side.

C.2.1 Soft body impact

For the soft body impact test the kit shall be assembled and connected with the wall ties to a rigid substrate. The height of the test specimen shall be at least 2 m. The width of the test specimen shall be at least 2 times the horizontal spacing between the wall ties.

C.3 Test procedure

Test procedure can be carried out using one of following options:

1. When the impact resistance is known, the impact tests indicated in Table C.3.1 for this known impact resistance shall be performed and when successful, the increasing impacts shall be applied until the highest impact resistance is established.

2. When the impact resistance is not known, then tests shall start with the lowest impact energies and continue increasing the impacts, with the aim of obtaining the maximum impact resistance.

Table C.3.1 - Hard and soft body impact tests

Impact test			Expression of results
Hard body impact	H1	• Weight: 0,5 kg • Impact: 1 J (height 0,20 m) • No. impacts: 3 • Position of impacts: three different locations	No deterioration (1) No penetrated (2) No perforated (3)
	H2	• Weight: 0,5 kg • Impact: 3 J (height 0,61 m) • No. impacts: 3 • Position of impacts: three different locations	No deterioration (1) No penetrated (2) No perforated (3)
	H3	• Weight: 1 kg • Impact: 10 J (height 1,02 m) • No. impacts: 3 • Position of impacts: three different locations	No deterioration (1) No penetrated (2) No perforated (3)
Soft body impact	S1	• Weight: 3 kg • Impact: 10 J (height 0,34 m) • No. impacts: 3 • Position of impacts: three different locations	No deterioration (1)
	S2	• Weight: 3 kg • Impact: 60 J (height 2,04 m) • No. impacts: 3 • Position of impacts: three different locations	No deterioration (1)
	S3	• Weight: 50 kg • Impact: 300 J (height 0,61 m) • No. impacts: 1 • Position of impacts: centre point between the wall ties	No deterioration (1)
	S4	• Weight: 50 kg • Impact: 400 J (height 0,82 m) • No. impacts: 1 • Position of impacts: centre point between the wall ties	No deterioration (1)

(1) Superficial damage, provided there is no cracking, shall be considered as showing "no deterioration" for all the impacts. Collapse or any other dangerous failure is not allowed.
(2) The test result shall be assessed as being "penetrate" if there is any cracking penetrating to be observed in the masonry unit (to be also observed by the rear side). Superficial cracking (no penetrating) is allowed. Collapse or any other dangerous failure is not allowed.
(3) The test result shall be assessed as being "perforated" if there is a destruction of the masonry unit (to be also observed by the rear side). Collapse or any other dangerous failure is not allowed.

C.4 Bodies to impact and test equipment

C.4.1 Soft body

Principle

The soft body impact test simulates an impact resulting from a person accidentally falling against the assembled kit.

The soft body shall be dropped from a height, creating an impact energy, which corresponds with the impact energy released by a person.

Test apparatus

The large soft body impactor shall be a spherical canvas bag of diameter (400 mm ± 40) mm (see Figure C.41.1) filled with (3,0 ± 0,3) mm diameter glass spheres to give a total weight of (50 ± 0,5) kg.

The small soft body impactor shall be a spherical ball of diameter (170 ± 50) mm, made of flexible material (e.g., rubber), and filled with sand or equivalent material size ≤ 2 mm to give a total weight of (3 ± 0,03) kg where the ball shall be almost full.

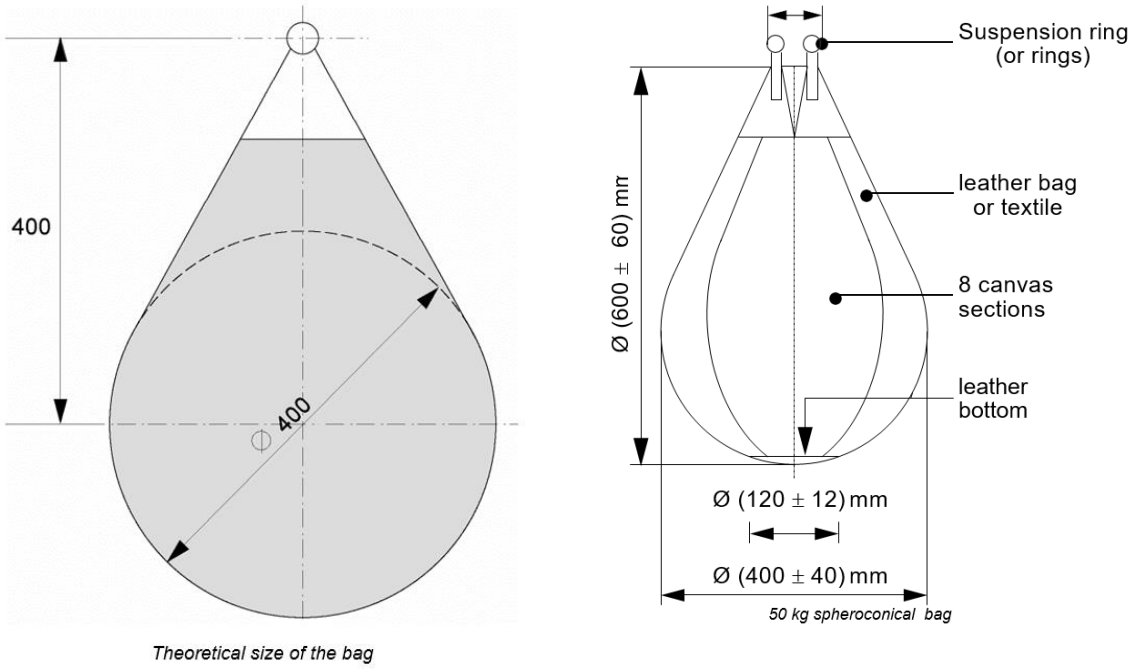

Figure C.4.1.1: Soft body impactor

C.4.2 Hard body

Principle

The hard body impact test simulates the impact, resulting from an object accidentally falling against the assembled kit.

The hard body shall be dropped from a height, creating an impact energy, which corresponds with the impact energy released by hard objects.

Test apparatus

The hard body impactor shall be a steel ball, with a diameter of (63,5 ± 1,0) mm, with a mass of (1030 ± 40) g (1 kg steel ball) and a steel ball, with a diameter of (50 ± 0,5) mm, with a mass of (514 ± 19) g (0,5 kg steel ball).

C.5 Test specimen

To define the mechanically weakest case of the assembled kit for the following aspects shall be taken into account:

- The mechanically weakest masonry unit (e.g., minimum thickness, minimum compressive strength, minimum grooved masonry unit resistance).
- The mechanically weakest connecting element (e.g., minimum thickness, minimum mechanical material characteristics).
- The mechanically weakest connecting element between masonry unit and wall tie (e.g., minimum thickness, minimum mechanical material characteristics).
- The mechanically weakest wall tie (e.g., minimum diameter, maximum length, minimum mechanical material characteristics).
- The maximum span between the wall ties (both vertically as horizontally).

ANNEX D: VERTICAL COMPRESSIVE STRENGTH OF THE (SELF-SUPPORTING) ASSEMBLY OF THE DRY STACKED MASONRY

D.1 General

The principle is to establish the vertical compressive strength of the (self-supporting) assembly of the dry stacked masonry units including the different connecting elements.

- The vertical compressive strength shall be determined in accordance with EN 1052-1 with the following amendments:
- Clause 5.2: Not applicable;
- Clause 7.1: Fully applicable except for the number of test specimens. At least 5 test specimens shall be considered.;
- Clause 7.2: Replace by E.2;
- Clause 10: Replace by Clause E.3;
- Clause 11: The items e), n), q) and r) are not applicable. Item h) applies to the description of the tested specimens (masonry units and connecting elements).

D.2 Construction of the specimens

The specimens shall be build up, in accordance with the dimensions given in Clause 7.1 of EN 1052-1 according to the Manufacturer's Product Installation Instructions, on one of the following bearing surfaces:

- a steel beam with a flat surface on which the specimen can be moved into the testing machine or
- directly in the testing machine.

The bearing surfaces of the specimen to be tested shall be flat, parallel to each other and perpendicular to the main axis of the specimen.

Between the bearing surface and the pressure plates of the testing machine a thin intermediate layer (e.g., mortar, gypsum or board) may be applied.

D.3 Test results statistical description

$f_k = f_{mean} - k_n \cdot S$

Where:

f_k = the characteristic vertical compressive strength of the dry stacked masonry units giving 75 % confidence that 95 % of the test results will be higher than this value
f_{mean} = the arithmetic average compressive strength
k_n = the variable as a function of the number of test specimens for 5 % (p = 0,95) with 75 % confidence level when the population standard deviation is unknown (see Table D.3.1)
S = the standard deviation of series under consideration

Table D.3.1 – The variable k_n as a function of the number of test specimens (see EN 1990 Eurocode: Basis of structural design, Table D1, Vx, unknown).

Number of specimens	3	4	5	6	7	8	10	20	30	∞
Variable k_n	3,37	2,63	2,33	2,18	2,10	2,00	1,92	1,76	1,73	1,64

ANNEX E: PREPARATION AND STORAGE OF TEST SPECIMEN

E.1 General

Ten specimens each for compression and tensile testing shall be prepared for testing the cavity width with ties mounted between masonry units in accordance with the specification of the product and a further two each at the cavity width plus 15 mm.

NOTE: The fastening or tie should be installed perpendicular to the face of the masonry unit.

E.2 Preparation

The test specimen shall have a length and width of one masonry unit and a height of two masonry units (see Figure E.2.1). Install the ties using the specified connecting elements between wall ties and masonry units. Ties shall be located to within ±10 mm of the centre of the specimen. If the masonry units are perforated or hollow or having indents, the ties shall be placed in the area of the perforated, hollow section or indent. Record the position of the ties in relation to any perforations or indentations of the bed of the masonry units.

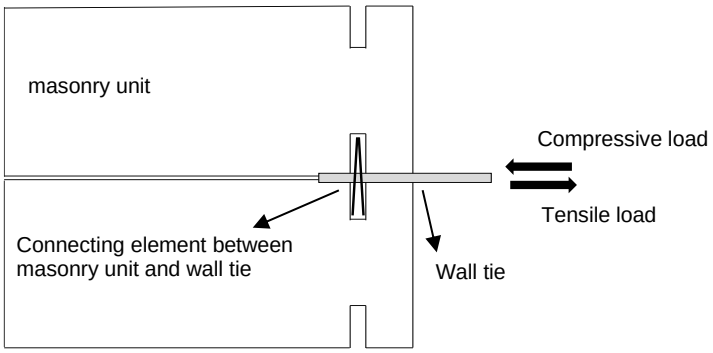

Figure E.2.1: Examples of test lay-out for resistance of the connecting element placed in the grooved masonry unit in combination with the wall tie.